

CURRICULUM VITAE

NAME: David A. Demer

ORGANIZATION: National Oceanic & Atmospheric Administration
Southwest Fisheries Science Center
P.O. Box 271, La Jolla, California
(858) 546-5603/5608 (phone/fax)

PRESENT POSITION: Ocean Acoustics Engineer (Research)

EDUCATION: B.S. Electrical Engineering, University of Arizona, 1986
Ph.D. Electrical and Computer Engineering (Applied Ocean Science), UC at San Diego / Scripps Institution of Oceanography, 1994

EXPERIENCE: 1999 to present: Leader of the Advanced Survey Technologies Program (FAST), **SWFSC**, Fisheries Resources Division. The program was created in 1999 to largely expand the scope of bioacoustical oceanographic research and to expedite the development of new survey methods and tools at the Southwest Fisheries Science Center. In addition to continuing the long-term acoustical studies in the Antarctic Ecosystems Research Group (primarily acoustical stock assessments of krill and fish off the Antarctic Peninsula), the reach of the FAST Program also includes collaborative research with the Tiburon and Honolulu Laboratories, and the Fisheries Resources and Marine Mammal Divisions.

1990 to 1999: Ocean Acoustics Engineer, **SWFSC**, Antarctic Ecosystem Research Group. Conduct research on underwater acoustics in support of U.S. commitments to the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR), part of the Antarctic treaty system: develop acoustic methodology and equipment for assessing zooplankton and fish stocks; design and execute acoustic stock assessment surveys and relate the results to predator foraging strategies; and develop and defend both methodological developments and stock management options based on this research at scientific meetings.

1987 - 1989 Product Engineer, **Intel Corporation**, Fab 7, Rio Rancho, New Mexico. Leader of integrated circuit failure analysis and defect reduction group. Designed and implemented statistical process control. Experienced with numerous analytical techniques including: scanning electron microscopy (SEM), energy dispersive x-ray analysis, micro-probing, capacitance-voltage testing, liquid crystal hot-spot detection, plasma- and wet-chemistry etches and others.

1985 - 1987 Undergraduate Research Technician, Microelectronics Laboratory, **University of Arizona**. Uniformity and profile studies of plasma-

etched silicon wafers. SEM analysis of plasma-etched silicon to determine temperature/etch depth and temperature/etch profile relationships. Studied the electrical effect of ion-damaged silicon, Schottky diode fabrication and via etching.

1985 **Kelon Corporation**, Tucson, Arizona. Medical billing and emission control software.

CURRENT RESEARCH:

Primary research projects now include the development and utility of small, multi-functional research platforms (currently manned; to include autonomous, stationary, and drifting), for economically addressing ecosystem-based fisheries management issues, assessing essential fish habitat, and studying predator-prey interactions (e.g. whale-krill, penguin-fish/krill, and seal-fish/squid/krill). Additional studies continue regarding uncertainty in echo integration techniques, enhanced methods for *in-situ* target strength measurements, multi frequency techniques for taxa identification and delineation, and behavioral observations of fish and zooplankton aggregations with underwater video and ADCP. Some of these investigations have included collaborative efforts with other divisions and institutions:

- A multi-year cooperative investigation of Sound, Oceanography, and Living Marine Resources (SOLMR) in the Ligurian Sea area of the Mediterranean with ICRAM, BAE SYSTEMS (formerly Tracor & Marconi). Sponsored by ONR and NATO's SACLANT Center.
- A study of the variability in krill dispersion, abundance, and recruitment, and the corresponding responses of vertebrate krill predators (chinstrap penguins and Antarctic fur seals). This work is incorporated into a long-term monitoring strategy sponsored by the U.S. Antarctic Marine Living Resources Program.
- Bioacoustics Program development with William Michaels at the North East Fisheries Science Center. The initial equipment shakedown, surveys, and *in-situ* TS measurements off Georges Bank were sponsored by the Coastal Ocean Program.
- Multi-frequency target strength measurements off Cape Cod Bay and the Grand Banks with William Michaels, NEFSC.
- Collaborative studies on acoustic technology, system calibration, target strength detection, and multi-frequency methods for taxa identification in collaboration with Ian Hampton, Mike Soule, Manuel Barange, and Alan

Boyd, Sea Fisheries Research Institution, Capetown, South Africa.
Sponsored by SFRI and U.S. AMLR.

- Collaborative work at South Georgia with Richard Veit, University of Washington, on winter sea bird foraging behavior in relation to the spatial aspects of their prey fields. Sponsored by National Science Foundation.
- Collaborative work with Donald Croll, University of Santa Cruz, on rorqual whales foraging in the Bay of La Paz and Monterey Bay. Sponsored by Office of Naval Research.
- Collaborative work with Steve Reilly and Paul Fiedler, SWFSC, on blue and fin whale foraging off Southern California. This work is part of a larger effort to describe whale migration patterns sponsored by the Marine Mammal Division, SWFSC.
- Collaborative work with Ric Brodeur and Jeff Napp, AKFSC, to describe the distribution of age-0 pollock and their zooplankton prey relative to hydrographic frontal structures in the vicinity of the Pribilof Islands. Sponsored by NOAA's Fisheries Oceanography Cooperative Investigations (FOCI) program.
- Collaborative work with Paul Smith and Jim Churnside to compare distributions of epi-pelagic fish schools as detected by underwater acoustics, LIDAR, and egg pump samples. Sponsored by the Coastal Fisheries Division, SWFSC.

CERTIFICATION: NOAA Working Diver and Variable Volume Dry-suit Certification

HONORS and AWARDS:

Hertz Foundation Fellowship recipient, UCSD/SIO, 1989-1994.
Superior Qualifications Appointment, NMFS/SWFSC, 1995
Annual "Certificate of Recognition", SWFSC, 1991-1998
Invited Speaker at ASA/EAA, Berlin, 1999

SCIENTIFIC COMMITTEES:

U.S. Delegate to the Working Group on Environmental Monitoring and Management reporting to the Scientific Committee of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)

U.S. participant to the Fisheries Acoustic Science and Technology Working Group reporting to the International Council for the Exploration of the Sea (ICES)

PUBLICATIONS:

Submitted or in press

D.A. Demer, M. Barange and A. Boyd, in press, "Measuring fish school velocities with an acoustic Doppler current profiler," *Int. Jour. On Fish. Sci., Fish. Tech. and Fish. Mgnt.*

D.A. Demer, D.A., R.P. Hewitt, and V.J. Loeb, submitted, "In situ target strength measurements of Antarctic zooplankton (*Euphausia superba* and *Salpa thompsoni*) at 120 and 200 kHz: corroboration of scattering models and a statistical technique for delineating species," *J. Acoust. Soc. Amer.*

D. A. Croll, R.P. Hewitt, D.A. Demer and J.A. Jansen, In preparation, "Penguin foraging behavior in relation to the distribution of prey," *Oikos*.

J.M. Napp, R.D. Brodeur, D. Demer, R. Hewitt, P.J. Stabeno and G.L. Hunt, Jr., Submitted, "Observations of nekton, zooplankton and seabirds distributions at tidally generated shelf fronts in the eastern Bering Sea," *Mar. Ecol. Prog. Ser.*

R.P. Hewitt and D.A. Demer, Submitted, "AMLR program: Temporal and spatial variability of Antarctic krill density in the vicinity of South Shetland Islands as estimated from acoustic surveys," *U.S. Antarct. Jour.*

R.P. Hewitt and D.A. Demer. In press. The use of acoustic sampling to estimate the dispersion and abundance of euphausiids, with an emphasis on Antarctic krill. *Fisheries Research*.

J.K. Jansen, R.W. Russell, R.P. Hewitt and D.A. Demer, Submitted, "Penguins limit foraging when forage is limiting: new perspectives on strategies of long-lived seabirds," 1999 Pacific Seabird Meeting.

1999

D.A. Demer, M.A. Soule and R.P. Hewitt, 1999, "A multi-frequency method for improved accuracy and precision of in situ target strength measurements," *Jour. Acoust. Soc. Am* 105(4):2359-2376.

A.S. Brierly, D.A. Demer, J.L. Watkins and R.P. Hewitt, 1999, "Concordance of interannual fluctuations in acoustically estimated densities of Antarctic krill around South Georgia and Elephant Islands: biological evidence of same-year teleconnections across the Scotia Sea," *Marine Biology* 134:675-681.

G. Swartzman, R. Brodeur, J. Napp, G. Hunt, D. Demer and R. Hewitt. 1999. Spatial proximity of age-0 walleye pollock (*Theragra chalcogramma*) to zooplankton near the Pribilof Islands, Bering Sea, Alaska. *ICES Jour. Mar. Sci.* 56(4):545-560.

G. Swartzman, R. Brodeur, J. Napp, D. Walsh, R. Hewitt, D. Demer, G. Hunt and E. Loggerwell, In press, "Relating predator and prey spatial distributions in the Bering Sea using acoustic backscatter data," *Can. J. Fish. Aquat. Sci.*, **56**(Suppl. 1): 188-198.

1998

D.A. Demer, 1998, "Some Suggestions for Acoustic Sampling Protocols for the Synoptic Survey of FAO Area 48," WG-EMM-98.

D.A. Croll, B.R. Tershy, R.P. Hewitt, D.A. Demer, P.C. Fiedler, S.E. Smith, W.A. Armstrong, J.M. Popp, T. Kiekhefer, V.R. Lopez, J. Urban, and D. Gendron, 1998, "An integrated approach to the foraging ecology of marine birds and mammals," *Deep Sea Res. II*, 45:1353-1371.

P. Fiedler, S. Reilly, R. Hewitt, D. Demer, V. Philbrick, S. Smith, W. Armstrong, D. Croll, B. Tershy and B. Mate, 1998, "Blue whale habitat and prey in the Channel Islands," *Deep Sea Res. II* 45:1781-1801.

E.A. Logerwell, R. P. Hewitt and D.A. Demer, 1998, "Scale-dependent spatial variance patterns and correlations of seabirds and prey in the southeastern Bering Sea as revealed by spectral analysis," *Ecography* 21:212-223.

S. Kim, V. Siegel, R. Hewitt, M. Nagonobu, D. Demer, T. Ichii, S. Kang, S. Kawaguchi, V. Loeb, A. Amos, K. Chung, O. Holm-Hansen, W. Lee, N. Silva and M. Stein, 1998, "Temporal changes in marine environments in the Antarctic Peninsula area during the 1994/95 austral summer," Mem. Nat. Inst. Polar Res. Special Issue No. 52:186-208.

Report of the Workshop on Area 48. La Jolla, USA, 15 to 26 July 1998. CCAMLR Working Group on Ecosystem Monitoring and Management. WG-EMM-98/16. 127p.

1997

R.P. Hewitt, G.W. Watters and D.A. Demer, 1997, "Indices of prey availability near the Seal Island CEMP site: 1990 through 1996," *CCAMLR Science* 4:37-45.

1996

D.A. Demer, M. Barange and A.J. Boyd, 1996, "Measurements of fish school velocities with an acoustic Doppler current profiler," *WG-EMM-96 CCAMLR*, Hobart, Australia.

D.A. Demer and M.A. Soule, 1996, "Uncertainty in echo sounder calibrations," *WG-EMM-96, CCAMLR*, Hobart, Australia.

R.P. Hewitt and D.A. Demer, 1996, "Lateral target strength of Antarctic krill," *ICES Jour. Mar. Sci.* 53(2):297-302.

R.P. Hewitt and D.A. Demer, 1996, "Distribution of volume backscattering strength near Elephant Island in the 1996 austral summer," *U.S. Antarct. Jour.* XXXI:134-136.

R.P. Hewitt, D.A. Demer, 1996, "Bioacoustic survey" in AMLR 1995/96 Field Season Report; Objectives, Accomplishments, and Tentative Conclusions, J.E. Rosenberg ed., *SWFSC Admin. Rep. LJ-96. WG-CEMP-96, CCAMLR*, Hobart, Australia.

R.P. Hewitt and D.A. Demer, 1996, "Distribution, biomass and abundance of Antarctic krill in the vicinity of Elephant Island during the 1996 Austral Summer," *WG-EMM-96 CCAMLR*, Hobart, Australia.

J.E. Zamon, C.H. Greene, E. Meir, D.A. Demer, R.P. Hewitt, and S.N. Sexton, 1996, "Three-dimensional visualization of acoustic observations of the prey field of foraging chinstrap penguins," *Mar. Ecol. Prog. Ser.* 131:1-10.

1995

D.A. Demer and R.P. Hewitt, 1995, "Bias in acoustic biomass estimates of *Euphausia superba* due to diel migration," *J. Deep-Sea Res.* 42(4), 455-475.

D.A. Demer and L.V. Martin, 1995, "Zooplankton target strength: Volumetric or areal dependence?," *J. Acoust. Soc. Am.* 98(2,1), 1111-1118.

D.A. Demer and L.V. Martin, 1995, "Zooplankton target strength: Volumetric or areal dependence?," ICES International Symposium on Fisheries and Plankton Acoustics held in Aberdeen 12-16 June, (abstract).

D.A. Demer and R.P. Hewitt, 1995, "In situ target strength measurements of Antarctic zooplankton (*Euphausia superba* and *Salpa thompsoni*) at 120 kHz and 200 kHz, corroboration of scattering models, and a statistical technique for delineating species," ICES International Symposium on Fisheries and Plankton Acoustics held in Aberdeen 12-16 June, (abstract).

R.P. Hewitt and D.A. Demer, 1995, "Lateral aspect target strength of Antarctic krill," ICES International Symposium on Fisheries and Plankton Acoustics held in Aberdeen 12-16 June, (abstract).

R.P. Hewitt and D.A. Demer, 1995, "Antarctic krill aggregation patterns as inferred from acoustic surveys," ICES International Symposium on Fisheries and Plankton Acoustics held in Aberdeen 12-16 June, (abstract).

R.P. Hewitt, V. Marin, and D.A. Demer, 1995, "An attempt to derive a composite index of abundance from acoustic surveys and fishery data," *WG-EMM95*, CCAMLR, Hobart, Australia.

R.P. Hewitt and D.A. Demer, 1995, "AMLR program: Distribution of volume backscattering strength near Elephant Island in the 1995 austral summer," *U.S. Ant. Jour.* 30(5) 219-221.

R.P. Hewitt, D.A. Demer, 1995, "Bioacoustic survey" in AMLR 1994/95 Field Season Report; Objectives, Accomplishments, and Tentative Conclusions, J.E. Rosenberg ed., *SWFSC Admin. Rep. LJ-95. WG-CEMP-95*, CCAMLR, Hobart, Australia.

J. Napp, R.D. Brodeur, R.P. Hewitt, and D.A. Demer, 1995, "Acoustic determination of plankton and nekton concentrations at tidally generated shelf fronts in the eastern Bering Sea," ICES International Symposium on Fisheries and Plankton Acoustics held in Aberdeen 12-16 June, (abstract).

1994

D.A. Demer, G. Chandran, J. Kirsch, R.P. Hewitt, N. Carbone, and J.E. Rosenberg, 1994, "Bioacoustic survey" in AMLR 1993/94 Field Season Report; Objectives, Accomplishments, and Tentative Conclusions, J.E. Rosenberg ed., *SWFSC Admin. Rep. LJ-94-13. WG-CEMP-94/37*, CCAMLR, Hobart, Australia.

D.A. Demer and R.P. Hewitt, 1994, "In-situ target strength measurements of Antarctic zooplankton," *J. Acoust. Soc. Am.*, 95(5,2):3021 (abstract).

D.A. Demer and L.V. Martin, 1994, "Zooplankton target strength: Areal or volumetric dependence?," *J. Acoust. Soc. Am.*, 95(5,2):3020 (abstract).

D.A. Demer, 1994, "Accuracy and precision of acoustic surveys of Antarctic krill", Ph.D. dissertation, University of California, San Diego, 144 p.

R.P. Hewitt and D.A. Demer, 1994, "AMLR Program: Distribution and abundance of krill in the Vicinity of Elephant Island during the 1993-1994 austral summer," *U.S. Ant Jour.* 29(5) 183-184.

R.P. Hewitt and D.A. Demer, 1994, "Acoustic estimates of krill biomass in the Elephant Island area: 1981-1993," *CCAMLR Science*, 1:1-7.

Veit, R.R., E.D. Silverman, R.P. Hewitt, and D.A. Demer, 1994, "Spatial and behavioral responses by foraging seabirds to Antarctic krill swarms," *U.S. Ant. Jour.* 29(5) 164-166.

1993

D.A. Croll, R.P. Hewitt, D.A. Demer and J. Jansen, 1993, "Penguin foraging behavior in relation to the distribution of prey," *WG-Krill-93/47*, CCAMLR, Hobart, Australia.

D.A. Demer, R. Bistodeau, R.P. Hewitt, J.E. Rosenberg, Y. Hu, 1993, "Bioacoustic survey" in AMLR 1992/93 Field Season Report; Objectives, Accomplishments, and Tentative Conclusions, J.E. Rosenberg ed., *SWFSC Admin. Rep. LJ-93-08. WG-CEMP-93/27*, CCAMLR, Hobart, Australia.

R.P. Hewitt and D.A. Demer, 1993, "Dispersion and abundance of Antarctic krill in the vicinity of Elephant Island in the 1992 austral summer," *Mar. Ecol. Prog. Ser.* 99:29-39.

R.P. Hewitt, V. Marin, and D.A. Demer, 1993, "An attempt to derive a composite index of abundance from acoustic surveys and fishery data," *WG-Krill-94/14 CCAMLR*, Hobart, Australia.

R.P. Hewitt and D.A. Demer, 1993, "AMLR program: Distribution and abundance of krill around Elephant Island, Antarctic, in the 1993 austral summer," *Antarctic Journal of the United States*, 28(5) 183-185.

1992

D.A. Demer and R.P. Hewitt, 1992, "Calibration of an acoustic echo-integration system in a deep tank, with system gain comparisons over standard sphere material, water temperature, and time," *CCAMLR Selected Scientific Papers, SC-CAMLR-SSP* 9:127-144.

D.A. Demer, D. McGehee, R.P. Hewitt, J.E. Rosenberg, S.N. Sexton, 1992, "Hydroacoustic survey" in *AMLR 1991/92 Field Season Report; Objectives, Accomplishments, and Tentative Conclusions*, J.E. Rosenberg and R.P. Hewitt eds., *SWFSC Admin. Rep. LJ-92-17. WG-CEMP-92/16*, CCAMLR, Hobart, Australia.

R.P. Hewitt and D.A. Demer, 1992, "AMLR Program: Distribution and abundance of krill in the vicinity of Elephant Island in the 1992 austral summer," *U.S. Ant. Jour.* 27(5):210-212.

R.P. Hewitt and D.A. Demer, 1992, "Distribution and abundance of krill in the vicinity of Elephant Island in the 1992 austral summer," *WG-CEMP-92/15*, CCAMLR, Hobart, Australia.

1991

R.P. Hewitt and D.A. Demer, 1991, "Krill abundance," *Nature*, 353: 310.

R.P. Hewitt and D.A. Demer, 1991, "Target strength of Antarctic krill," *WG-Krill-91/13*, CCAMLR, Hobart, Australia.

R.P. Hewitt and D.A. Demer, 1991, "Acquisition and evaluation of an acoustic system for mapping the distribution of Antarctic krill. NOAA/NMFS/SWFC Rep. LJ-91-46:23p.

S.N. Sexton, J.E. Rosenberg, and D.A. Demer, 1991, "Volumetric analysis of Antarctic marine ecosystem data," *WG-Krill-91/38*, CCAMLR, Hobart, Australia.

RESEARCH CRUISES:

2000

CCAMLR 2000 / AMLR00 -- "Multi-national synoptic survey of FAO statistical area 48 / Antarctic Marine Living Resources 2000 field season," Acoustics, Oceanography, and Meteorology; Quantitative acoustical measurements of krill distribution and abundance in an area around Elephant Island, Antarctica, R/V *Yuzhmorgeologiya*, Jan.-Feb.

1999

SIRENA99 -- Sound, Oceanography and Living Marine Resource studies in the Ligurian Sea, Acoustics and Oceanography; fin and sperm whales, habitat, and prey survey, R/V *Ammiraglio Magnaghi*, Aug.

Headlands 99 -- Acoustics; Tiburon Lab's annual groundfish survey, San Francisco Bay to Monterey Bay to San Diego, NOAA R/V *David Starr Jordan*, Jun.

1998

AMLR98 -- "Antarctic Marine Living Resources 1998 field season," Chief Scientist and Acoustics; Quantitative acoustical measurements of krill distribution and abundance in an area around Elephant Island, Antarctica, R/V *Yuzhmorgeologiya*, Feb.-Mar.

ECHO98, "Euphausiids and Canyon Habitat Observations," Acoustics; San Francisco Bay to Monterey Bay to San Diego, NOAA R/V *McArthur*, 9-23 Jul.

ECHOMED98, "Foraging ecology of fin whales in the Ligurian Sea," Acoustics; Collaborative predator-prey investigations with ICRAM in the Mediterranean Sea between Italy and Corsica, R/V *Bestiaccia*, Sept.

1997

AMLR97 -- "Antarctic Marine Living Resources 1997 field season," Chief Scientist and Acoustics; Quantitative acoustical measurements of krill distribution and abundance in an area around Elephant Island, Antarctica, R/V *Yuzhmorgeologiya*, Feb.- Mar.

DE9708 -- Acoustics; Collaborative bioacoustic survey with NEFSC, Cape Cod Bay and Georges Bank, NOAA R/V *Delaware II*, Jul.-Aug.

1996

AMLR96 -- "Antarctic Marine Living Resources 1996 field season," Acoustics; Quantitative acoustical measurements of krill distribution and abundance in an area around Elephant Island, Antarctica, R/V *Yuzhmorgeologiya*, 3 Jan.-19 Mar.

WHAPS96 -- "Whale habitat and Prey Study," Acoustics; Predator-prey studies conducted with researchers from UCSC, the Monterey Bay Marine Sanctuary, and SWFSC's Marine Mammal Division. Associations were investigated between Blue and Fin whales, zooplankton, ambient noise, water masses, and bathymetry in the Gulf of California and around California's northern Channel Islands, R/V *David Starr Jordan*, 10 Jul.-4 Aug.

1995

AMLR95 -- "Antarctic Marine Living Resources 1995 field season," Acoustics; Quantitative acoustical measurements of krill distribution and abundance in an area around Elephant Island, Antarctica, NOAA R/V *Surveyor*, 10 Jan.-10 Feb.

La Paz 95 -- Acoustics; Predator-prey studies of Blue and Fin whales and euphausiids in the Bay of La Paz, Baja California, Mexico, R/V *Amigo*, 6 Apr.-7 May.

COP95 -- "Coastal Ocean Programs," Acoustics; Acoustic system shakedown and in-situ target strength measurements off Georges Bank, R/V *Kathadin*, Apr. 10-18.

“International Bioacoustics Investigations,” [Acoustics](#); Development and test of a variety of acoustic tools for investigating fisheries resources in False Bay, South Africa, R/V *Fridtjof Nansen*, 9-18 Oct.

“Sea Trials,” [Acoustics](#); Development and test of single-target detection algorithms and echosounder firmware in False Bay, South Africa, R/V *Algoa*, 25-30 Oct.

1994

AMLKR94 -- “Antarctic Marine Living Resources 1994 field season,” [Acoustics](#); Quantitative acoustical measurements of krill distribution and abundance in an area around Elephant Island, Antarctica, NOAA R/V *Surveyor*, 12 Jan.-9 Feb.

FOCI94 -- “Fisheries Oceanography Coordinated Investigations (FOCI) 1994 Bering field season,” [Acoustics](#); Characterization of juvenile walleye pollock in relation to hydrographic fronts near the Pribilof Islands, Alaska, NOAA R/V *Surveyor*, 16-22 Sep.

1993

AMLR93 -- “Antarctic Marine Living Resources 1993 field season,” [Acoustics](#); Acoustical measurements of krill distribution and abundance in an area around Elephant Island, Antarctica, NOAA R/V *Surveyor*, 11 Jan.-9 Feb.

“Foraging behavior and dispersion of pelagic birds,” [Acoustics](#); Acoustical measurements of krill distribution and abundance in an area around South Georgia Island, Antarctica, NSF R/V *Nathaniel B. Palmer*, 26 May-30 Jun.

“Submarine acoustical observations of zooplankton in Wilkinson Basin,” [Acoustics](#); Acoustical measurements of zooplankton from the submersible Johnson Sea-Link, R/V *Edwin Link*, 13-19 Sep.

“Sea trials,” [Acoustics](#); Engineering tests of the echosounder, hull-mounted transducers, and data collection system for AMLR93, NOAA R/V *Surveyor*, 22 Nov.

1992

AMLR92 -- “Antarctic Marine Living Resources 1992 field season,” [Acoustics](#); Acoustical measurements of krill distribution and abundance in an area around Elephant Island, Antarctica, NOAA R/V *Surveyor*, 15 Jan.-13 Feb.

“Sea trials,” [Acoustics](#); Engineering tests of the echosounder, towed-body and data collection system for AMLR 1993, NOAA R/V *David Starr Jordan*, 12-25 Nov.

1991

AMLR91 -- “Antarctic Marine Living Resources 1991 field season,” [Acoustics](#); Acoustical measurements of krill distribution and abundance in an area around Elephant Island, Antarctica, NOAA R/V *Surveyor*, 16 Jan.-17 Mar.

“Coastal marine mammal survey,” [Acoustics](#); Acoustical measurements of krill distribution and abundance along the California coast, NOAA R/V *McArthur*, 29 Jul.-8 Aug.

“Sea trials,” [Acoustics](#); Engineering tests of the echosounder, towed-body and data collection system for AMLR 1992, NOAA R/V *McArthur*, 3-12 Dec.

1990

“Sea trials,” [Acoustics](#); Engineering tests of the echosounder, towed-body and data collection system for AMLR 1991, Navy Ship *de Steiguer*, 29-30 Nov.